PVP 19

Code: 19EC3503

III B.Tech - I Semester – Regular Examinations – JANUARY 2022

CONTROL SYSTEMS ENGINEERING
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.
4. All parts of Question paper must be answered in one place

PART – A

1. a) Define signal flow graph.
   b) Define transient response & steady state response.
   c) How the roots of characteristic equation are related to stability?
   d) What is Nyquist stability Criterion?
   e) What are the advantages of state space analysis over transfer function analysis?

PART – B

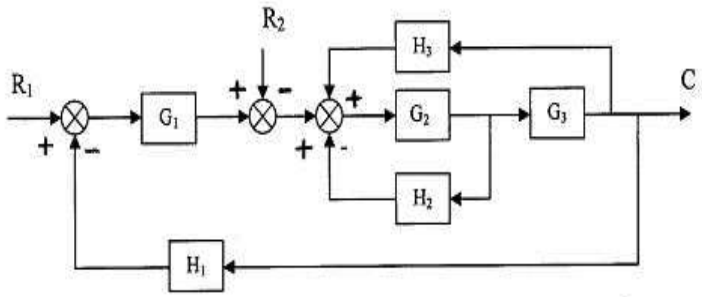
UNIT – I

2. a) Explain Mason's gain formula. 8 M

   b) Explain the advantages and features of transfer function. 4 M

OR

3. For the system represented in the given figure, obtain transfer function C/R_1 and C/R_2 12 M



UNIT – II

4. What is meant by steady state error? Obtain the expression for steady state error for various standard inputs. 12 M

OR

5. Transfer function of unity feedback control system is G(s) =25/s(s+5). Obtain the rise time, peak time, maximum overshoot and the settling time when the system is subjected to a unity step input. 12 M

UNIT-III

6. For the unity feedback system whose open loop transfer function is: $G(s) = \frac{K}{S(S+1)(S+2)(S+5)}$ .Find the range of 'K' for stability. 12 M

i) Find the value of 'K' for marginal stability.

ii) Find the actual location of the closed loop poles by using Routh-Hurwitz criterion.

OR

7. The characteristic polynomial of a system is : $s^7 + 9s^6 + 24s^5 + 24s^4 + 24s^3 + 23s^2 + 15s = 0$. Determine the location of roots on s-plane and hence the stability of the system. 12 M

UNIT – IV

8. Draw a polar plot of the frequency response for the transfer function given by: $G(s)= \frac{(S+5)}{S(S+2)(S+4)}$ 12 M

OR

9. Sketch the Bode plot for the following transfer function and determine the system gain K for the gain cross over frequency to be 5 rad/sec. 12 M

$G(s) = \frac{KS^2}{(1+0.2S)(1+0.02S)}$

UNIT – V

10. a) State and prove the properties of state transition matrix. 6 M

    b) What is state space? List the advantages of state space analysis. 6 M

OR

11. Diagonalize the system matrix $A= \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -5 & -4 \end{bmatrix}$ 12 M